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Using Virtual Worlds and Sloodle to Develop Educative Applications

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Abstract. Education is one of the most interesting applications of virtual worlds, as they can create opportunities to offer educative contents with the advantages of online courses, with the feel of "presence" that this immersive environments can provide. While most of social networking resources are mainly focused on sharing contents using a traditional web interface, virtual worlds facilitate the creation of social networks that enhance the perception and communication among its users through the use of additional modalities. In this paper we analyze the main resources provided by the Second Life virtual world and Sloodle to develop educational environments and describe their application in a educative project at the Universidad Carlos III de Madrid.

Keywords: Virtual Worlds, Second Life, Sloodle, E-Learning.

1 Introduction

Social networking has emerged in the context of the Web 2.0 as a global consumer phenomenon in recent years. According to [1], two-thirds of Internet users visit social networking or blogging, an activity that consumes 25% of the time spent in the network. In fact, the access to social networks is currently the most used Internet activity using both computers or mobile devices to access Internet. The importance acquired by this type of activity is not only profoundly changing the ways of communication, share information and interact with Internet users, but also has a great impact in our daily lives [2, 3].

The development of so-called Web 2.0 has also made possible the introduction of a number of Internet applications into many users' lives, which are profoundly

changing the roots of society by creating new ways of communication and cooperation. The popularity of these technologies and applications has produced a considerable progress over the last decade in the development of social networks increasingly complex. Among them, we highlight virtual social worlds, which are computer-simulated graphic environments in which humans, through their avatars, "cohabit" with other users. Although traditional virtual worlds were structured a priori predefining tasks performed by their users, social interaction has currently a key role in these environments and users can determine their experiences in the virtual world according to their own decisions. Thanks to the social potential of virtual worlds, they are becoming a useful tool in the teaching-learning process [4, 5]. This way, virtual environments currently enable the creation of learning activities that provide an interactivity degree that is often difficult to achieve in a traditional classroom, encouraging students to become protagonists of the learning process and also enjoy while they are learning.

However, most of the virtual campus and educational applications in these immersive environments have only been created to replicate real world places without providing benefits from, for instance, consulting these applications in a classical webpage. This way, several initiatives and research projects currently focus on the integration of virtual worlds and virtual learning environments. One of the most important initiatives is Sloodle (Simulation Linked Object Oriented Dynamic Learning Environment) (*http://www.sloodle.org*)), a free and open source project which integrates the multi-user virtual environments of Second Life (*http://secondlife.com/*) with the Moodle learning-management system (*http://moodle.org/*). This way, Sloodle provides a range of tools for supporting learning and teaching to the immersive virtual world which are fully integrated with the Moodle web-based learning management system, currently used and tested by hundreds of thousands of educators and students worldwide.

In this paper we summarize our experience in a Teaching Innovation Program at the Universidad Carlos III de Madrid, in which we have defined the main objective of studying a set of basic tools and utilities that are provided by the Second Life virtual world in combination with Sloodle to develop educational applications. In addition, we describe the application of these utilities in a experience with students of the Computer Engineering Degree at our university.

2 Educative Applications of Virtual Worlds

As stated in the introduction, virtual words provide a combination of simulation tools, sense of immersion and opportunities for communication and collaboration that have a great potential for their application in education. However, as criticized in [6], many of the existing educative experiences in virtual worlds only replicated traditional approaches into the new environment, such as for example recreating classrooms co-located in a virtual world. Although such direct translation does not leverage all the potential of the technology, it provides an added value in the case

of online courses, for example, as a mean of e-assessment for large classes during a course.

In these cases, virtual worlds have been usually employed to replicate real world activities, and it has been reported that experiences in the virtual world have a similar effectiveness in terms of learning than in real world [7]. Nevertheless, field experience is usually needed to obtain more meaningful learning. Anyhow, virtual settings that reproduce real situations help to reduce costs or to offer improved learning activities to the students with the same budget. For example, [5] used avatar-mediated training in medicine to teach the students how to deliver bad news.

Virtual environments also allow the creation of learning activities that cannot take place in the real world, thus fostering experiential learning or "learning by doing" [8]. In addition, virtual worlds allow creating manageable representations of abstract entities and thus help students to construct mental models by direct observation and experimentation. For instance, Mikropoulos et al. identified that science and technology courses had much more presence in virtual worlds than social studies and argued that this might be because the concepts explained are usually more abstract, unobservable or far from everyday experience [4].

Other interesting unique characteristics of virtual worlds which were not exploited in these cases are immersion, manipulability and first order experience. In some virtual environments students are immersed in the virtual world, this provides and enhanced interactivity which would be very difficult in a traditional classroom and that makes the students become protagonists of the learning experience [9]. Such a sense of immersion generally fosters engagement of the students with the tasks and the course, or, in a more general sense, with the formation of their own understanding. According to [4], most of the educational studies of virtual worlds claim that virtual interaction favors engagement.

Virtual worlds also provide new opportunities for collaboration, as they facilitate synchronous and asynchronous communication, supporting and enhancing student-student and teacher-student interaction. Petrakou reported that the students involved in their research socialized just like they do in real world courses, trying to get to know each other, and also learning to cope with the new environment [10]. They also reported that the student-student interaction continued after the course when some students discussed the assignments and tried to reach a common understanding.

To fully benefit from all the described characteristics of the virtual worlds, the course contents must be active and designed following a pedagogical strategy that leverages the potential that virtual worlds offer [7]. This way, knowledge is acquired on the basis of authentic real-world problems, for which the solution is a communal task that must be achieved as the union of the individual efforts in the virtual world.

3 Educational Applications Using Second Life and Sloodle

Second Life (SL) is a three dimensional virtual world developed by Linden Lab in 2003 and accessible via the Internet. SL is one of the most popular virtual social worlds: a population today of millions of residents worldwide. It uses very advanced

technologies for the development of realistic simulations, so that avatars and the environment are more credible and similar to real world users. The ability to customize SL is extensive and facilitates innovation and student participation, which also enhances the naturalness of the interactions that take place in the virtual world. SL is currently being used with success as a platform for education by many institutions, such as colleges, universities, libraries and government entities.

Besides the previously described features, Second Life presents several utilities specifically tailored for their use in education; probably the most relevant is Sloodle, an open source project which integrates Second Life with the Moodle learning-management system. Sloodle provides a range of tools for supporting learning and teaching to the immersive virtual world. Firstly, it allows controlling the user registration and participation in a course thanks to an *Access Checker* as depicted in Figure 1. Also new users can register in a course using the so-called *Enrol_Booth*.

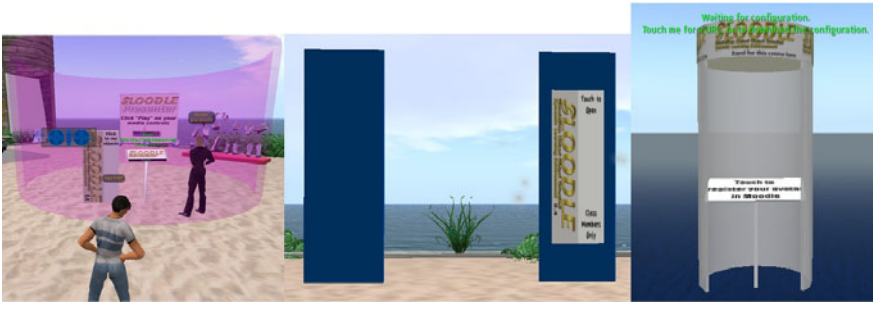

Fig. 1 *Sloodle Access Checker* activated by entering a login zone (left), *Access Checker* with a door (middle) and *Enrol_Booth* (right)

Secondly, there are several tools to create surveys in Sloodle, such as *Choice Horizontal*, *Quiz Chair* or *Quiz Pile* on (Figure 2). *Choice horizontal* allows instructors to create and show surveys in the virtual world, compile the information and show the results in a course. With *Quiz Chair* an avatar can answer questionnaires of a course in SL, while with *Quiz Pile On* provides a similar functionality with a more amusing format. In *Quiz Pile On*, questions in the form a text that floats over a pile, the students seat over the correct answer and if the answer is wrong, he falls over.

Thirdly, the *Sloodle Presenter tool* (shown in Figure 3) allows creating presentations in Second Life, which can combine images, web pages and videos and may be configured so that any avatar or only the owner of the corresponding sim controls the display of the presentation. Finally, there are other interesting tools for object sharing such as the *PrimDrop*, which allows students to deliver their works by sending objects in Second Life, or the *Vending Machine*, which can be used to deliver object to the students (Figure 3).

Fig. 2 *Choice Horizontal*, *Quiz Chair*, and *Quiz Pile* On utilities

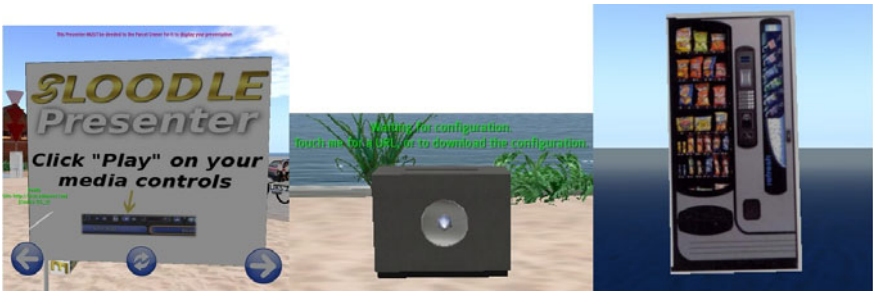

Fig. 3 *PrimDrop* (left) and *Vending Machine* (right)

4 Practical Educative Experience

One of the main objectives defined in a Teaching Innovation Program in which we participate at the Universidad Carlos III de Madrid is the development of enhanced e-learning systems to accelerate the learning process, facilitate access, personalize the learning process, and supply a richer learning environment. This way, the study and application of the different tools and utilities described in the previous section was defined as a key point to fulfill this objective. The subject Compilers of the Computer Science Degree was selected for the elaboration of different questionnaires for the experience. The methodology defined for the evaluation of this subject, promoted by the introduction of the new European degrees at our university, emphasizes students' continuous assessment based on students' effort and active participation in their learning. The application of this experience is defined as training activities and also as a part of the continuous assessment of the subject. In terms of training activity, the program aims to adequately follow not only the student learning process throughout the delivery of the proposed activities but also to reinforce students about the assimilation degree of the learning objectives and competencies acquired during the course.

A set of questionnaires with a total of 110 questions, practical cases and problems was elaborated for the subject to carry out the study and evaluation of the educational utilities provided by SL Sloodle. A total of 119 students, in groups of

40 students, participated in the experience. For the generation of the different questions and practical cases for the subject, we considered the following types of exercises:

- Questions concerning theoretical contents as a review of methodologies and concepts (e.g., what is a token?, which are the main modules that make up a compiler? which are the main methodologies studied to develop a syntax analyzer?);
- connection with programs (like the Flex (*http://flex.sourceforge.net/*) lexical analyzer generator and the Yacc (*http://sourceforge.net/projects/byacc/*) parser generator. These programs were used to propose students to deal with practical implementations and provide them with code execution (e.g., define the regular expressions to detect identifiers and numbers in a specific programming language, write a parsing grammar to detect valid if-then-else statements);
- practical cases proposed to the student to obtain conclusions about the appropriate processes for resolve specific problems (develop a practical compiler given the requirements of a simple programming language, test the application of the SLR(1) technique to parse a given input statement, apply the described optimization techniques to reduce the cost execution of a specific programming code).

These questionnaires were implemented by means of a repository for the questions in the Moodle space at the University and using the tools provided by Sloodle for viewing and implementing them in the Second Life virtual world. It should be emphasized that the total of questions were answered by 89% of students. A 86% percentage of students expressed the usefulness of the provided cases and problems to facilitate the achievement of the objectives of the course, enhance their learning and facilitate knowing the degree of understanding of the different contents.

The experience was planned so that in an initial session students were introduced to the concepts needed to interact in the virtual world (download and installation of the browser, creation and personalization of the avatar, resources to search and locate resources, teleportation, use of the described educational utilities, etc). Then, a laboratory session with a duration of 90 minutes was carried out at the end of each one of the units of the course.

In these sessions students accessed the virtual world to answer the questionnaires elaborated with the contents corresponding to each unit in the subject, so that each session served to reinforce the learning process acquired with the master classes. In addition, the participation of a lecturer in the coordination of each one of these sessions made possible the detection of the concepts for which there was a greater number of errors in completing the questionnaires. Thus, each of the laboratory sessions with Second Life was followed with a master lecture to address identified problems and reinforce these concepts.

We have already completed a preliminary evaluation of the experience based on a questionnaire to assess the students' opinion about their previous knowledge on the used technologies, value the possibilities of interaction and communication in the virtual world, assess the the educative utilities proposed in the different activities, and evaluate the learning process. The questionnaire included the following 10 questions:

- *Q1*: State on a scale from 1 to 5 your previous knowledge about new technologies for information access;
- *Q2*: How many times have you accessed virtual worlds like Second Life?;
- *Q3*: Was it easy for you to interact with the different utilities to complete the questionnaires?;
- *Q4*: Do you think that the design of the learning environment is correct?;
- *Q5*: Do you think that the questionnaires cover the main contents of the course?;
- *Q6*: Was it easy for you to communicate with the other participants?;
- *Q7*: Were you sure about what to do at every moment?;
- *Q8*: Do you think that the experience has helped you to better prepare the course?;
- *Q9*: In general terms, are you satisfied with the experience?;
- *Q10*: Indicate which are the most valuable points of the experience and what you should improve.

The first nine questions were assigned a numeric value between one and five (in the same order as they appear in the questionnaire). Table 1 shows the average, minimal and maximum values for the subjective evaluation.

Table 1 Results of the preliminary evaluation of the educative experience (1=minimal value, 5=maximum value)

	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9
Average value	4.6	2.8	4.3	3.8	4.6	3.1	3.5	4.5	4.4
Maximum value	5	4	5	5	5	4	4	5	5
Minimal value	4	1	3	3	3	3	2	4	4

From the results of the evaluation, it can be observed that students positively evaluated the most relevant aspects of the experience, such as the quality of the proposed utilities and contents designed to develop of the learning environment, the potential of virtual worlds to the development of educative activities and the possibilities of communication, socialization and interaction that these immersive environments provide. In addition, they highly appreciated the experience in terms of the main objectives of facilitating the learning process and reinforcing the acquisition of the contents. The set of points to be improved included the possibility of extending the number of activities, the facilitation of a more detailed feedback for each incorrectly answered question, as well as the doubts originated with the use of some of the described utilities. Students also emphasized the facility of answering the required questions, learning from the provided feedback and also enjoying and socializing with the rest of students thanks to the functionalities provided by the Sloodle tools and the interaction in the Second Life virtual world.

5 Conclusions

Social networks and virtual worlds offer a wide range of educational opportunities that make them immersive learning scenarios in which students can explore, meet other residents, socialize, participate in individual and group activities, and cooperate to create the environment. This contribution is focused on presenting the results of a study of the educational utilities provided by the Sloodle tool, which makes possible the use of Moodle in the Second Life virtual world. To do this, we have applied these tools in the learning process of one our the subjects. The results of the project show both the good evaluation by students as well as the educational potential of these tools. As future work, we are extending the experience during this academic year, including in our study several functionalities to adapt the environment and Sloodle tools taking into account student's specific needs, considering their evolution during the course as one of the main aspects to perform this adaptation. We also want to evaluate the benefits of using the Sloodle tools in combination with other virtual worlds like the ones that can be created using OpenSimulator (*http://opensimulator.org*).

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